ON SOME HERBS CONTAINING CELLULOSE IN IRAQ

by

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There is no doubt, that the demand for cellulose for paper-making is continually increasing. This cellulose is mostly taken from the trees and rarely from grasses or herbs, though these cover in some countries great areas. The use of of such plants for the production of cellulose would be important in countries, where wood is rare or where trees do not grow at all, as a.g. in desert countries. To such countries belongs the Iraq, which until now is compelled to import all necessary cellulose from abroad.

In North Africa there is the *Stipa tenacissima*, giving cellulose, used for making a paper of high quality. The plant is exported from Algeria to Europe in big quantities. It would be obvious to look for similar plants in Iraq.

During my investigations of the vegetation of Iraq I found until now the following plants which could be used for paper manufacturing:

1. DEMOSTACHYA BIPINNATA (L.) STAPF

Demostachya bipinnata, called so by STAPF, is a synonyme to *Eragrostis bipinnata* (L.) Muschl. or *Eragrostis cyanosuroides* (R. et S.) Retz. The plant belongs to the Saharo-Indian Element in the sense given by EIG (1931) that is to say it is a plant from the Southern part of the Desert Zone or the Subzone of the Real Desert.

BOISSIER mentions it under the name of *Eragrostis cyanosuroides* (R. et S.) Retz „in tota Aegypto, in Syria littorali, Babylonia, Afgania and Belutschia". MAIRE (1953) says, that the plant occurs in Tropical Africa, in Egypt, South-Western Asia and India. In the Sahara it forms meadows on the borders of the torrents, where the water is not deep under the soil. It occurs too in Northern Africa in the Sahara. In Egypt the plant is called Halfa. The plant is mentioned by ZOHARY (1950) for „Lower Mesopotamia", that is to say for the middle and southern parts of Iraq. The herbarium of the University College of Arts and Science in Baghdad possesses specimens from Kadhemain near Baghdad, from Baquba and other parts of the Diyala Liwa, where the plants grow up to the Djebel Hamrin, and from the Hilla Liwa, where the plants were found in great

quantities. I found the *Demostachya bipinnata* on the borders of the fields, near fenches, and walls, on mountains, on the dikes of the ditches and canals for irrigation and in the desert. Sometimes the plants grow as a meadow.

Demostachya bipinnata can grow in dense communities forming the Demostachyetum bipinnatae association with a degree of cover-5. The quantity of the plant available from a square meter varies between 2000—1000 grams that is to say between 2 and 10 tons of dry herbs from a hectar.

2. ERIANTHUS RAVENNAE (L.) P. B.

This grass, called by Linné *Saccharum Ravennae* and by PALISOT DE BEAUVOIS *Erianthus Ravennae*, according to Maire, consists of two varieties the var. *genuinum* Hackel and the var. *parviflorum* (Pilger) Maire. The plant growing in Iraq belongs to the first variety.

Erianthus Ravennae is a plant of wide distribution. BOISSIER (1888) mentions it in his Flora orientalis: „Regio mediterranea Europae et Africae borealis, ditiones Scinde et Punjab Indiae borealis". According to MAIRE (1952) the plant occurs in Southern Europe, Western Asia to Tibet and in Jamaica.

As to Iraq, ZOHARY (1950) quotes *Erianthus Ravennae* for Amadia, Rawanduz, Erbil, Sulaimaniya and the Lower Mesopotamia. I observed it in great quantities near Ramadi, Khanikin, near Zakho and Dohuk. The plants grow near the rivers, in large tufts and give an excedently large amount of vegetable bulk. So I estimated that one square meter contains up to 1000—1500 gr of dry plants, that is to say the amount of dry plants on one hectar would be about 10—15 tons. The same amount is quoted by KRASILNIKOW and JAKIMOW. for *Erianthus purpurascens* Anderss. growing in Central Asia. This plant contains 41.47% of cellulose and can be used for making a rough paper. As to the *Erianthus Ravennae* in Iraq, the yield seems to be a little smaller.

According to EIG the plant belongs to the Mediterranean and Irano- Turanian element, that is to say it is a biregional element, with an area laying in the Mediterranean Region and in the Subzone of the Semi Desert. It is thus a plant with a more northern distribution as the *Demostachya*. We can observe it in Iraq: *Demostachya* occurs here in the Southern part of the country meanwhile the *Erianthus* is a plant occurring in its Northern part.

3. IMPERATA CYLINDRICA (L.) P. B.

The taxonomy of the plants growing in Iraq is not investigated yet. BOISSIER describes no varieties, but MAIRE in his Flora of Northern Africa mentions two varieties, the var. *europaea* (Pers. Anderss.) and

the var. *parviflora* Trabut. According to EIG *Imperata cylindrica* belongs to the Mediterranean-Irano-Turanian-Saharo-Indian Tropical group, that is to say it is an element of the Mediterranean Region and of the Zone of the Deserts and the Tropical Zone. This world wide distribution is to be seen from the literature. So BOISSIER quotes the plant in dry sandy places in humid sandy places and near ditches, in the whole region from Greece and Macedonia, Transcaucasia, Syria, Egypt and it oases, in Arabia, Babylonia, Northern Persia, Southern Persia, Afganistan to Belutchistan. Moreover he quotes it in the Mediterranean Region of Africa and Europe, in East India, South Africa (Cape of Good Hope), Australia, America. MAIRE quotes the var. *europaea* for the Islands of Canaries, the Mediterranean Region and Western Asia to Turkestan and India, meanwhile the var. *parviflora* occurs in the central part of the Sahara. The other varieties, occur in Tropical and Southern Africa, in Southern Asia, in the Malayan Archipelago, Australia and Tropical Africa. So it is a plant with a world wide distribution consisting probably of several varieties and probably of several subspecies or perhaps some different species.

As to Iraq, the plant is growing here, according to ZOHARY, in the regions of Amadia, in the Lower Mesopotamia and in the Jezirah. I found the plant growing in great quantities in the palm forests near Basrah, forming here dense communities; an *Imperatetum cylindricae* association, in Baghdad and in other places. But the quantity of the plants on one square meter is much smaller, than the yield of *Demostachya* and *Erianthus*, so I did not study it for the possibility of using it for the fabrication of paper, though KRASILNIKOW and JAKIMOW quote the plant as containing cellulose for paper making.

Thus we see, that the three grasses *Demostachya bipinnata*, *Erianthus Ravennae* and *Imperata cylindrica* can be used for paper making. They are important in desertic countries of the Zone of Desert, where they grow on sandy soils or loamy soils, which are more or less dry and which are not suitable for the cultivation of other plants.

But before starting with the manufacturing of paper, the following questions would have to be investigated:

1. The biology of the three plants, their vegetative growth, their flowering and the production of seeds.
2. Taxonomy: subspecies and varieties.
3. Conditions of the soil, dry, humid degree of humidity, acidity of the soil and so on.
4. Influence of cutting every year and growth after being cutted.
5. The possibility of cultivating in deserts, by seed or by cuttings.

Supposing the cultivation of the plants would prove to be success-

ful, it would be possible to start a paper industry based on grasses growing in the desert. This method of paper manufacturing would be especially suitable to conditions in Iraq. I therefore sent some specimens of the *Demostachya* and of the *Erianthus* to Dr. R. Runkel. Forest and Wood Research Station in Reinbeck near Hamburg and received from his assistant following report concerning the suitability of these two grasses for the manufacturing of paper:

DR. HEINZ SCHAMBACH

REPORT ON THE SUITABILITY OF THE TWO GRASSES – ERAGRASTIS BIPINATA AND IMPERATA – FROM IRAK FOR PAPERMAKING

The two grasses *Eragrastis bipinata*[1] and *Imperata*[2] were sent us from Irak with a view ot examining their suitability for the manufacture of paper. The grasses were examined singly and in mixtures for this purpose. The paper produced from these grasses in our Laboratory was examined for the various technical properties.

Each grass was treated singly with 2,4% caustic soda solution at 100°C. The proportion of grass to soda solution was 1:10. The raw pulp so obtained was comparatively light in colour, so that the bleaching was rapid and required a less amount of chlorine. For 1 kg of dry raw pulp about 330 g chlorine was used.

The values of the various technical properties for *Imperata* are very favourable, 1380 doublefolds, a breaking length of aproximately 8000 m, and a very good tear strengh of 121 cmg/cm². Paper obtained from *Imperata* therefore, shows better strength properties as are necessary for newspaper. So that *Imperata*, if there is enough of it, can be used as a basis for a factory for good paper.

By *Eragrastis*, in comparison, one does not obtain such very good values as for *Imperata*. Because of its lower values for breaking length, double folds and tearing strength, the *Eragrastis* can only be used for the production of comparatively lower grades of paper, for example newspaper.

Freeness value	Beating time	Double folding	Breaking length	Tearing strength	Bursting	Yields calculated of dry grass
°SR	min		m	cmg/cm²	m²	
Imperata[2]						
35,5	0	7	2241	53	11,9	30%
51,5	15	710	6851	112	18,6	
65,5	30	1380	7946	121	41,7	
Eragrastis[1]						27%
63,0	15	116	5233	80	28,1	
82,5	30	243	5882	82	35,0	

[1]) Demostachia bipinnata. [2]) Erianthus Ravennae.

Next, a mixture of *Imperata* and *Eragrastis*, 1:1, was treated exactly as before with 2,4% caustic soda solution at 100° C. The proportion of mixture to solution was as before 1:10. The values obtained for this mixture were generally lower than the ones obtained from *Imperata*. They lay between the values for *Imperata* and *Eragrastis*.

The colour of the raw pulp obtained from the mixture is lighter than the pulps obtained from either grass, when treated alone. In this case, therefore, the amount of chlorine required for bleaching was still less, being 245 g chlorine for 1 kg dry raw pulp.
Especially remarkable is the value for tear strength-129 cmg/cm². The double folds-value (500) is also favourable, so that the mixture of these grasses can not only be used as a raw material for newspaper production but also for better paper.

Freeness value	Beating time	Double folding	Breaking length	Tearing strength	Bursting	Yields calculated of dry grass
°SR	min		m	cmg/cm²	m²	
Eragrastis-Imperata 1:1						
43,0	15	143	5446	104	34,9	28%
55,0	30	329	5596	110	38,2	
64,0	40	469	5535	129	42,6	

There is a fourth plant in Iraq, belonging to the family of the Gramineae which contains a great amount of cellulose, it is *Phragmites communis* occurring in all parts of the country, but especially in great quantities in the lake district between the Tigris and the Euphrates in the southern parts of the country. The taxonomy is not investigated, but it seems likely that there grows the typical form and the var. *pseudodonax* A. et Gr. The more detailed investigation of this plants has not been finished.

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